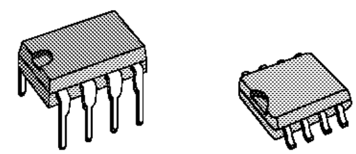
SGS-THOMSON MICROELECTRONICS

L4949

MULTIFUNCTION VERY LOW DROP VOLTAGE REGULATOR

ADVANCE DATA

- OPERATING DC SUPPLY VOLTAGE RANGE 5V - 28V
- TRANSIENT SUPPLY VOLTAGE UP TO 40V
- EXTREMELY LOW QUIESCENT CURRENT IN STANDBY MODE
- HIGH PRECISION STANDBY OUTPUT VOLTAGE 5V±1%
- OUTPUT CURRENT CAPABILITY UP TO 100mA
- VERY LOW DROPOUT VOLTAGE LESS THAN 0.4V
- RESET CIRCUIT SENSING THE OUTPUT VOLTAGE
- PROGRAMMABLE RESET PULSE DELAY WITH EXTERNAL CAPACITOR
- VOLTAGE SENSE COMPARATOR
- THERMAL SHUTDOWN AND SHORT CIRCUIT PROTECTIONS

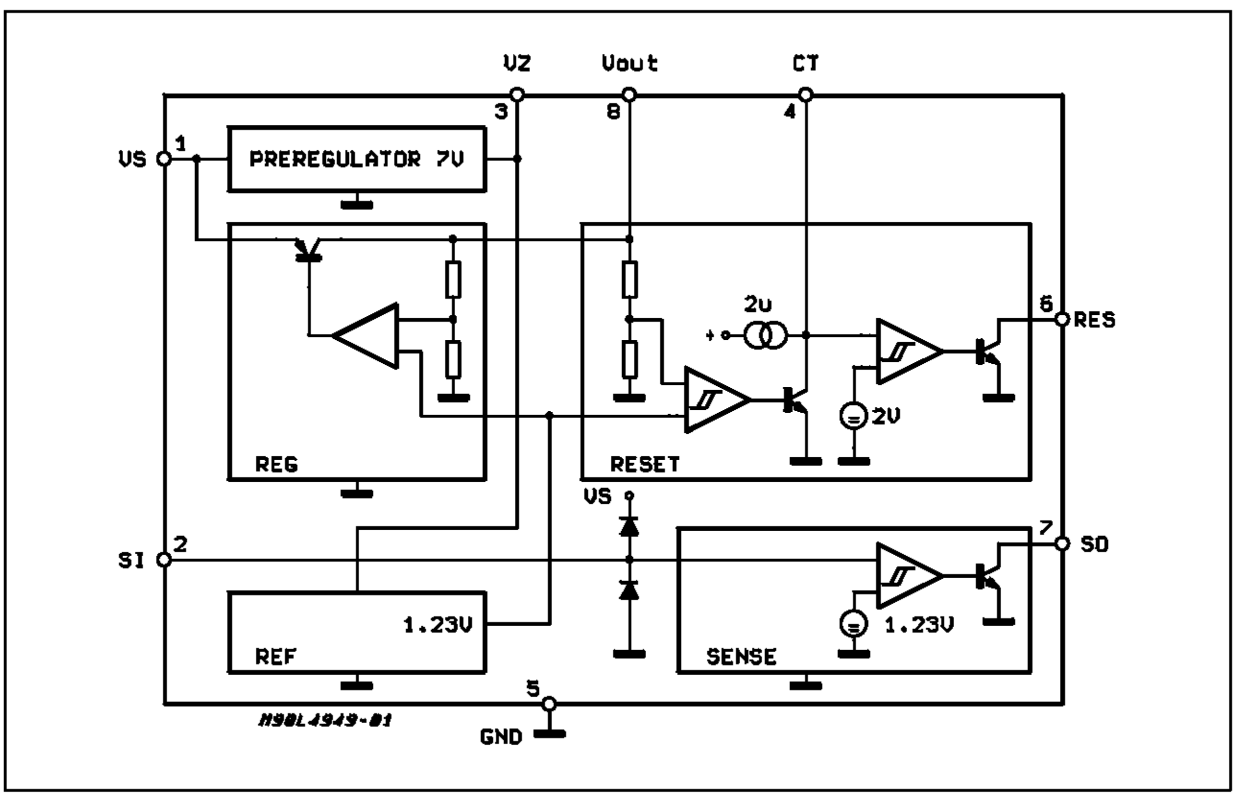


Minidip	SO-8
ORDERING NUMBERS:	
L4949N	L4949DN

DESCRIPTION

The L4949 is a monolithic integrated 5V voltage regulator with a very low dropout output and additional functions as power-on reset and input voltage sense. It is designed for supplying the microcomputer controlled systems especially in automotive applications.

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{SDC}	DC Operating Supply Voltage	28	V
V_{STR}	Transient Supply Voltage (T < 1s)	40	V
I_O	Output Current	Internally Limited	
V_O	Output Voltage	20	V
I_{SI}	Sense Input Current	±1	mA
I_{EN}	Enable Input Current	-1	mA
V_{EN}	Enable Input Voltage	V_S	
V_{RES}, V_{SO}	Output Voltages	20	V
I_{RES}, I_{SO}	Output Currents	5	mA
V_Z	Preregulator Output Voltage	7	V
I_Z	Preregulator Output Current	5	mA
T_J	Junction Temperature	-40 to +150	°C
T_{stg}	Storage Temperature Range	-55 to +150	°C

Note: The circuit is ESD protected according to MIL-STD-883C

THERMAL DATA

Symbol	Description		Minidip	SO-8	Unit
$R_{th\ j\text{-}amb}$	Thermal Resistance Junction-ambient	Max	100	200	°C/W
TJSD	Thermal Shutdown Junction temperature		165		°C

ELECTRICAL CHARACTERISTICS (V_S = 14V; -40°C < T_j < 125°C unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_O	Output Voltage	T_J = 25°C; I_O = 1mA	4.95	5	5.05	V
V_O	Output Voltage	6V < V_{IN} < 28V, 1mA < I_O < 50mA	4.90	5	5.10	V
V_O	Output Voltage	V_{IN} = 35V; T < 1s 1mA < I_O < 50mA			5.50	V
V_{OP}	Dropout Voltage	I_O = 10mA I_O = 50mA I_O = 100mA		0.1 0.2 0.3	0.25 0.4 0.5	V V V
V_{IO}	Input to Output Voltage Difference in Undervoltage Condition	V_{IN} = 4V, I_O = 35mA			0.4	V
V_{OL}	Line Regulation	6V < V_{IN} < 28V; I_O = 1mA			20	mV
V_{OLO}	Load Regulation	1mA < I_O < 100mA			30	mV
I_{LIN}	Current Limit	V_O = 4.5V V_O = 0V (note 1)	105	200 50	400	mA mA
I_{QSE}	Quiescent Current	I_O = 0.3mA; T_J < 100°C		150	260	µA
I_Q	Quiescent Current	I_O = 100mA			5	mA

RESET

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_{RT}	Reset Thereshold Voltage			V_O -0.5V		V
V_{RTH}	Reset Thereshold		50	100	200	mV

Note 1: Foldback characteristic

ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
t_{RD}	Reset Pulse Delay	C_T = 100nF; $T_R \geq$100µs	55	100	180	ms
t_{RR}	Reset Reaction Time	C_T = 100nF		5	30	µs
V_{RL}	Reset Output Low Voltage	R_{RES} = 10KΩ to V_O $V_S \geq$ 3V			0.4	V
I_{RH}	Reset Output High Leakage Current	V_{RES} = 5V			1	µA
V_{CTth}	Delay Comparator Thereshold			2		V
$V_{CTth, hy}$	Delay Comparator Thereshold Hysteresis			100		mV

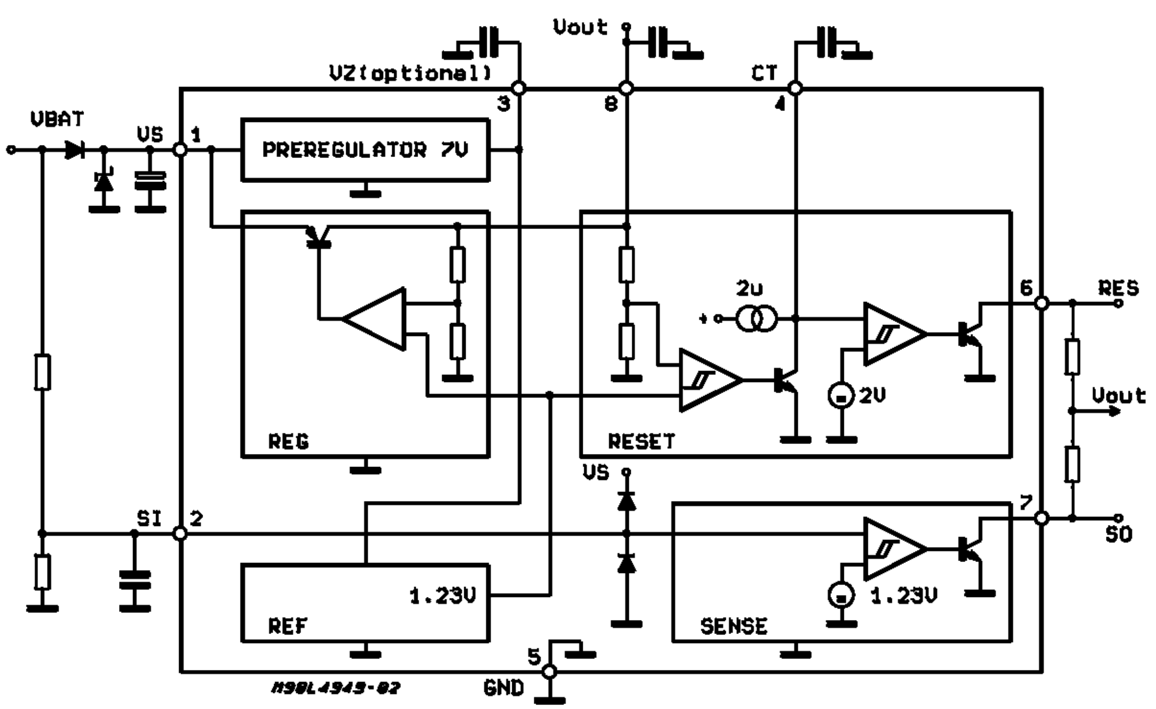
SENSE

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_{st}	Sense Low Thereshold		1.16	1.23	1.35	V
V_{sth}	Sense Thereshold Hysteresis		20	100	200	mV
V_{SL}	Sense Output Low Voltage	$V_{SI} \leq$ 1.16V; $V_S \geq$ 3V R_{SO} = 10KΩ to V_O			0.4	V
I_{SH}	Sense Output Leakage	V_{SO} = 5V; $V_{SI} \geq$ 1.5V			1	µA
I_{SI}	Sense Input Current		-1	0.1	1	µA

PREREGULATOR

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_Z	Preregulator Output Voltage	I_Z = 10µA		7		V
I_Z	Preregulator Output Current				10	µA

APPLICATION CIRCUIT



For stability: $C_S \geq$ 1µF, $C_O \geq$ 4.7µF, ESR < 10Ω at 10KHz
Recommended for application: $C_S = C_O$ = 10µF

APPLICATION INFORMATION

Supply Voltage Transient

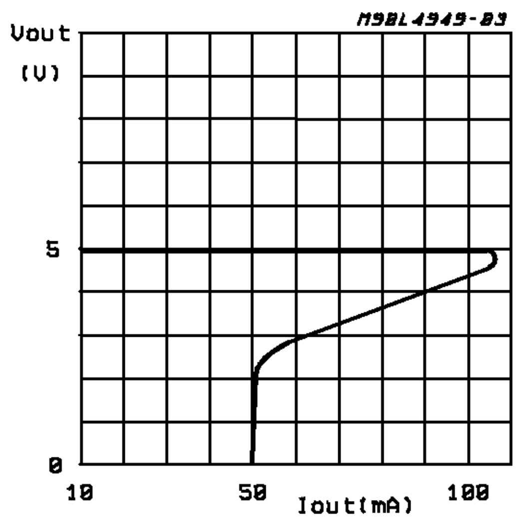
High supply voltage transients can cause a reset output signal disturbation.

For supply voltages greater than 8V the circuit shows a high immunity of the reset output against supply transients of more than 100V/µs.
For supply voltages less than 8V supply transients of more than 0.4V/µs can cause a reset signal disturbation.

To improve the transient behaviour for supply voltages less than 8V a capacitor at pin 3 can be used.

A capacitor at pin 3 (C3 ≤ 1µF) reduces also the output noise.

Figure 1: Foldback Characteristic of V_O



FUNCTIONAL DESCRIPTION

The L4949 is a monolithic integrated voltage regulator, based on the STM modular voltage regulator approch. Several outstanding features and auxiliary functions are implemented to meet the requirements of supplying microprocessor systems in automotive applications. Nevertheless, it is suitable also in other applications where the present functions are required. The modular approach of this device allows to get easily also other features and functions when required.

Voltage Regulator

The voltage regulator uses an Isolated Collector Vertical PNP transistor as a regulating element. With this structure very low dropout voltage at currents up to 100mA is obtained. The dropout operation of the standby regulator is maintained down to 3V input supply voltage. The output voltage is regulated up to the transient input supply voltage of 35V. With this feature no functional interruption due to overvoltage pulses is generated.

The typical curve showing the standby output voltage as a function of the input supply voltage is shown in Fig. 2.

The current consumption of the device (quiescent current) is less than 200µA.

To reduce the quiescent current peak in the undervoltage region and to improve the transient response in this region, the dropout voltage is controlled, the quiescent current as a function of the supply input voltage is shown in Fig. 3.

Preregulator

To improve the transient immunity a preregulator stabilized the internal supply voltage to 7V. This internal voltage is present at Pin 3 (V_Z). This voltage should not be used as an output because the output capability is very small (≤10µA). This output may be used as an option when a better transient behaviour for supply voltages less than 8V is required (see also application note). In this case a capacitor (100nF - 1µF) must be connected between Pin 3 and GND. If this feature is not used Pin 3 must be left open.

Figure 2: Output Voltage vs. Input Voltage

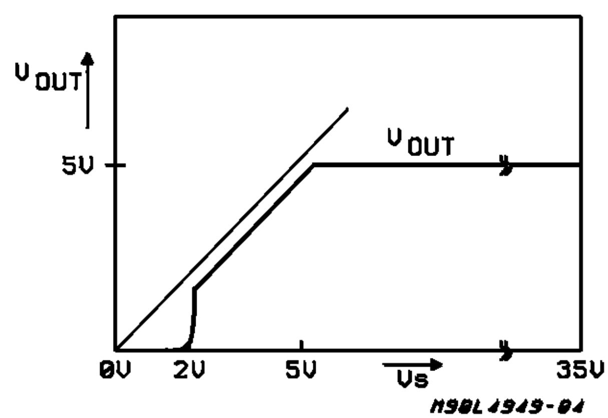
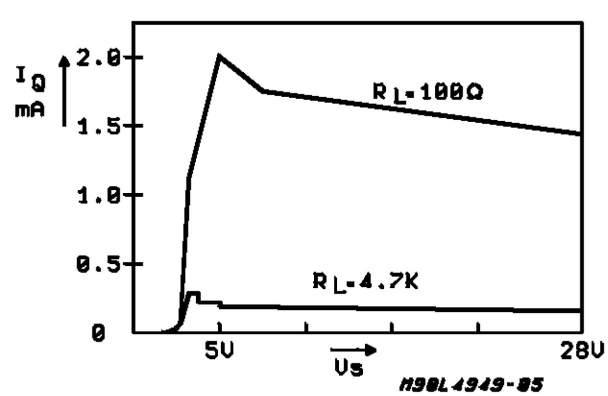


Figure 3: Quiescent Current vs. Supply Voltage



Reset Circuit

The block circuit diagram of the reset circuit is shown in Fig. 4. The reset circuit supervises the output voltage. The reset thereshold of 4.5V is defined with the internal reference voltage and standby output drivider.

The reset pulse delay time t_{RD}, is defined with the charge time of an external capacitor C_T:

$$t_{RD} = \frac{C_T \bullet 2V}{2\mu A}$$

The reaction time of the reset circuit originates from the discharge time limitation of the reset capacitor C_T and is proportional to the value of C_T.

The reaction time of the reset circuit increases the noise immunity. Standby output voltage drops below the reset threshold only a bit longer than the reaction time results in a shorter reset delay time. The nominal reset delay time will be generated for standby output voltage drops longer than approximately 50µs.
The typical reset output waveforms are shown in Fig. 5.

Sense Comparator

The sense comparator compares an input signal with an internal voltage reference of typical 1.23V. The use of an external voltage divider makes this comparator very flexible in the application. It can be used to supervise the input voltage either before or after the protection diode and to give additional informations to the microprocessor like low voltage warnings.

Figure 4

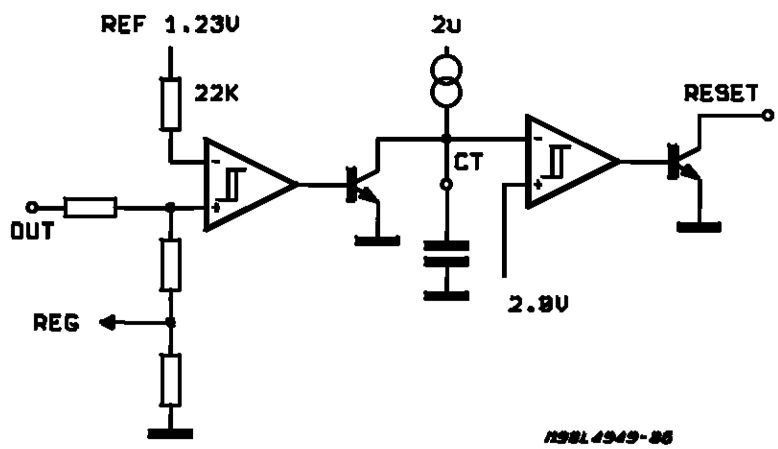
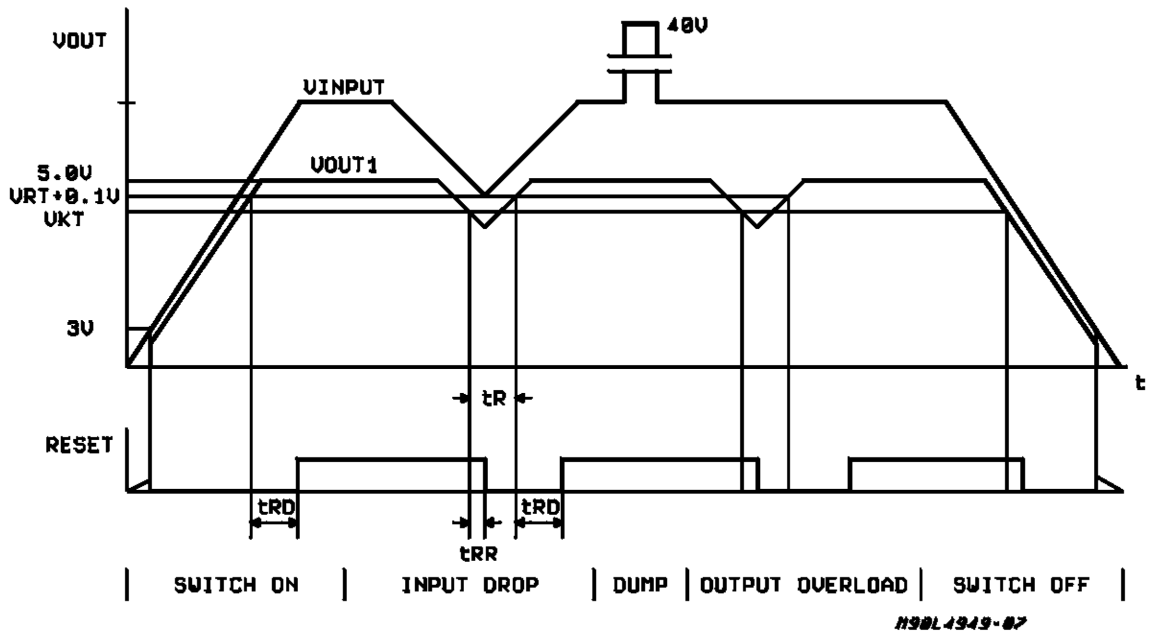
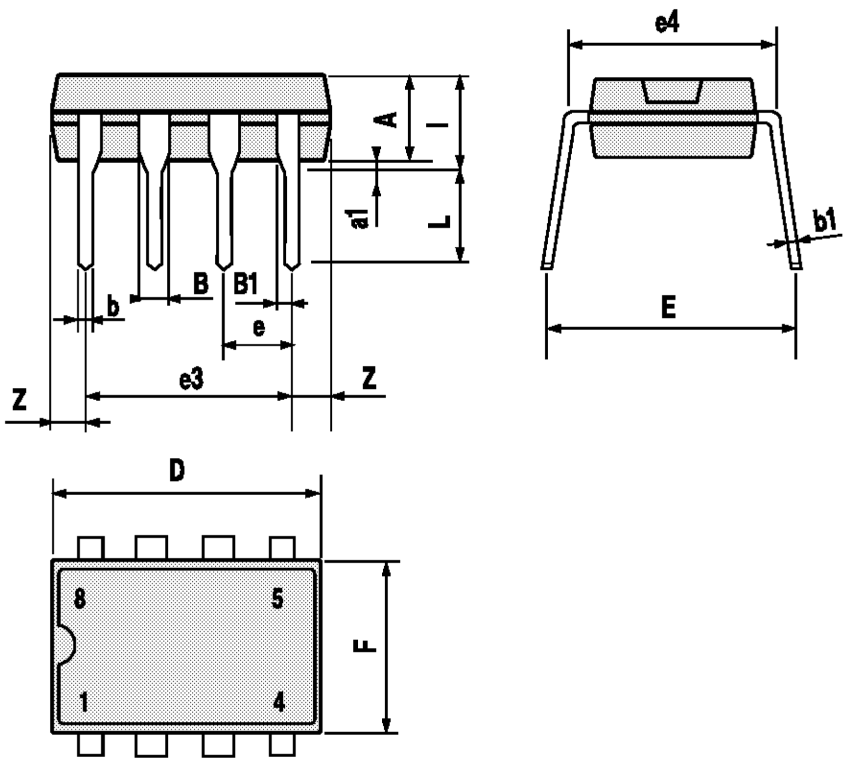


Figure 5


VOUT
VINPUT
40V
5.0V
VRT+0.1V
VKT
VOUT1
3V
t
tR
RESET
tRD
tRD
tRR
SWITCH ON
INPUT DROP
DUMP
OUTPUT OVERLOAD
SWITCH OFF
M98L4949-07

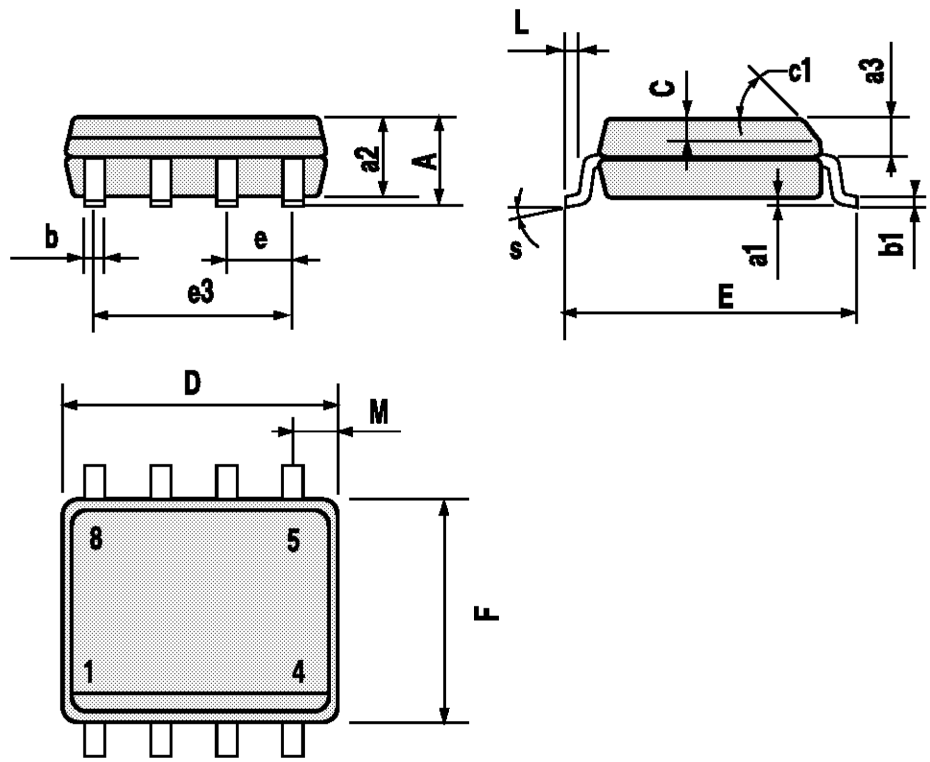
MINIDIP PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A		3.32			0.131	
a1	0.51			0.020		
B	1.15		1.65	0.045		0.065
b	0.356		0.55	0.014		0.022
b1	0.204		0.304	0.008		0.012
D			10.92			0.430
E	7.95		9.75	0.313		0.384
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			6.6			0.260
I			5.08			0.200
L	3.18		3.81	0.125		0.150
Z			1.52			0.060



SO8 PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
a3	0.65		0.85	0.026		0.033
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.020
c1	45° (typ.)					
D	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.15		0.157
L	0.4		1.27	0.016		0.050
M			0.6			0.024
S	8° (max.)					



SGS-THOMSON Microelectronics GROUP OF COMPANIES

Australia - Brazil - France - Germany - Hong Kong - Italy - Japan - Korea - Malaysia - Malta - Morocco - The Netherlands - Singapore - Spain - Sweden - Switzerland - Taiwan - Thaliand - United Kingdom - U.S.A.